

ANNUAL REPORT

1941



ALLEGHENY FOREST EXPERIMENT STATION

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EXPERIMENT STATION

UNITED STATES DEPARTMENT OF AGRICULTURE

Forest Service

ANNUAL REPORT

1941

ALLEGHENY FOREST EXPERIMENT STATION

624 Bankers Securities Building

Philadelphia, Pa.

Hardy L. Shirley, Director

In cooperation with the University of Pennsylvania

Report of the
Allegheny Forest Experiment Station
For 1941

Today serious minded citizens realize that the nation's war effort requires the fullest possible use of resources, machinery, and man power. They also realize that the peace of the future must be based on a positive program of international collaboration in economic and cultural activity. It is therefore timely to scrutinize meticulously all activities in our country, particularly those supported at public expense, to determine the extent to which they contribute to the nation's war effort or the type of peace we are fighting for. The Allegheny Station has attempted to subject its research program to just such scrutiny. In this report we have set forth the extent to which each project contributes to the war effort or peace aims. In order that our conclusions may be properly appreciated, it is desirable first to get a picture of the task confronting the forest and timber industry, and the relationship of this task to other great production tasks.

On September 24, 1940, Secretary Wickard bravely predicted that no industry in America was better prepared than agriculture to go on a wartime basis. Events of the past year have fully confirmed his statement. But it was not always so. From 1921 to 1938, agriculture was chronically depressed. Prices were low and chaotic; production uncontrolled; financial distress led to mortgage foreclosures and large scale land abandonment; water and wind erosion were permanently depleting farm productivity; fences and buildings were falling into disrepair; and farm machinery replacements were at a bare minimum. The problem was aggravated by the large number of farm units, some six million in all. Attacking this problem on a broad, comprehensive scale, American farmers aided by the Department of Agriculture and its state affiliates, have accomplished a truly remarkable feat. They have immensely increased control over their own destiny, and at the same time provided the consumer protection against shortages. We now enter the war with full assurance that food and agricultural fiber to support our military and civilian fronts through an indefinite period of total war will be provided in ample abundance for our own requirements, and with sizeable surpluses for supporting our allies; that this production will be accomplished without rationing, without permanent jeopardy to our soil resources, without undue increase in prices to consumers, and without requiring elaborate new governmental agencies or appropriations to handle wartime needs.

Only three uncertainties cloud the farm production outlook: possible shortages of labor, of farm machinery, and of processing, warehousing, and distributing facilities. These are largely beyond the farmers' control.

grain

Contrast the bright outlook in agriculture with that of other fields of industrial activity, particularly metal production and fabrication, tool making, and pulp and paper manufacture. In general, the outlook for timber and timber products is better than that for metals, chemicals, and tools, but it is far from reassuring. It is true that our Nation has an ample supply of standing timber for conversion into foreseeable wartime needs; yet this timber is largely concentrated on the West Coast and in the South, far removed from the great industrial centers of the Eastern Seaboard and Middle West. Nation-wide shortages in pulp and paper and wood chemicals already exist. Plywood is barely adequate to meet needs. Charcoal and activated carbon are at a premium. Piling and ship timbers are being widely sought. Cutting of timber is proceeding at a greatly accelerated pace throughout the country.

7 The paramount obligations of public foresters during the war period are, first, to make certain that our country's timber needs are adequately met; and second, that in meeting these needs permanent forest productivity is impaired as little as possible. This statement would seem to require little elaboration; yet when viewed realistically it must be admitted that the foresters as compared with the farmers are ill-equipped to redeem their responsibilities.

Our Nation long ago learned to look not to the butcher or meat packer but to the farmer when it needed an increase in beef, pork, or mutton. Today, it still looks to the lumberman instead of the forester for an increase in timber products; yet only the forester is trained to determine how much timber can safely be removed from our country's forests. Foresters and the public still lack those controls over timber harvesting that can assure permanent maintenance of forest productivity, and cutting standards that will increase not decrease the yield. Without such controls and without the corollary features of a well integrated and comprehensive forestry program comparable in scope to the farm program, public foresters can advise, exhort, and implore timberland owners to manage their timber harvesting operations in their own best interests and in the interests of national welfare; but they have no means of bringing effective pressure on anyone to ensure that he does this.

It is still early to predict the demands that a country at war must place on its Forest Experiment Stations. We can anticipate, however, that heavy demands will be made, and that the utmost economy and efficiency in operation will be expected. The Station must be prepared to shift to new duties and responsibilities on very short notice. It therefore becomes an immediate responsibility of every Experiment Station worker so to arrange his work that current tasks and obligations can be dropped and new ones undertaken with minimum sacrifice of the permanent forest research program. All loose ends should be caught up; unfinished manuscripts completed or discarded if of insufficient merit to justify completion; progress reports should be finished; working plans drafted in such careful form that others can carry on necessary work should the one now in charge be required for other duties. This is the immediate task before each Station worker.

Second in importance is the careful review of all existing projects to determine which ones and which phases can be curtailed for the duration of the war, should shortage in personnel, funds, or research facilities make such curtailment necessary. Finally, every staff member should review carefully the lines along which he can contribute most to the total war effort.

THE TASKS OF AN EXPERIMENT STATION DURING WARTIME

A Forest Experiment Station has four major obligations to meet during war: (1) Carrying out assigned war duties; (2) preparing to perform additional tasks likely to be assigned; (3) planning for the post-war period; and (4) maintaining important long-term research projects that cannot be suspended without serious loss of past work or costly delay in meeting future needs.

Current Defense Assignments

The Station has been specifically called upon to assist in the agricultural defense program. Two members of the Station's staff are on State War Boards, and six members are participating in the work of County Boards. The Station members are calling to the attention of State and County Boards and of farmers also, the important contribution that farm woodlots can and are making to the war, and are advising how this contribution can be made with a minimum loss in long time productivity of the farm woodlots. A second defense assignment has been to participate in an appraisal of the impact of the defense program on the forests of the region. This involves, for the territory in which the Station is actively working, an estimate of the increased cutting caused by defense, and any changes in forest practice that may have occurred due to the enlarged market for timber products. A third task is to meet current requests for information made by other defense agencies. During 1941, the Station had seven specific requests: The first pertained to the usefulness to the Army of a power chain saw for felling timber; the second was a request for a possible location for a fiber board company requiring aspen and basswood, two species rarely found in abundance in Pennsylvania; the third was for possible industrial sites in the anthracite region. The Station was able to meet these three requests in a thoroughly satisfactory manner. A fourth request has come from the Soil Conservation Districts that the Station participate with other agencies in making a survey of local markets for woodlot products. Surveys have been completed for three districts and have been requested for two additional districts. The Station has begun work to meet this request. A fifth request from the Forest Service, R-8, was for an opinion as to the suitability of certain chemical treatments for prolonging the life of burlap seed bed covers. A sixth request came indirectly from the army for chemical treatments that would ensure high survival and rapid growth of transplanted trees and shrubs. These two requests were answered mainly in the negative, but to the satisfaction of the enquirer. A final request, which the Station has as yet been unable to meet satisfactorily, is for an

impartial study of the time required to fell, limb, buck, and pile chemical wood, and of the variation resulting from method of cutting, size of timber, and skill of the workmen. A corollary to this study is the possibility of introducing mechanized equipment into chemical wood harvesting. This has important defense bearing, because wood cutters are scarce and war demands for wood chemicals urgent.

Probable War Assignments

One of the most likely assignments to the Station is the estimation of the timber requirements of the region and of the extent to which these can be and are being met by local supplies ^{1/}. The Station feels that it is in a position rapidly to plan, supervise, and conduct a timber inventory of the entire Allegheny Station territory. It hopes during the next few months to perfect for this region a technique of estimating timber from aerial photographs supplemented by a minimum of ground work. With such technique available, it becomes a simple matter to get a rapid estimate for the entire region. A second task is to do everything that it can to increase the efficiency of forest fire protective organizations. This means aid in fuel type mapping, probably through the use of aerial photographs; perfecting danger meters; analyzing past fire records for causes of fires and if possible improving fire prevention techniques. A third task similar to timber condition and fuel type mapping is the preparation of military maps for the War Department. Such maps require accurate delineation of size and character of timber. The fourth is preparing standards of forest practice that will minimize loss of future forest productivity as a result of wartime timber cutting.

Post-Defense Planning

If in the post-war period America is to be free from military attack, is to enjoy free access to the natural resources of the world, and if its citizens are to be assured ample food, good housing, and permanent employment; and furthermore, if our country in cooperation with its allies is to extend these benefits to all nations, post-war planning must be on a bold scale indeed. It means, first of all, that each nation must operate its internal economy on a full time basis. The future will be an economy of production, not an economy of money. Fiscal machinery will be developed to aid in the production and distribution of goods, and fiscal policy directed to ensure and not obstruct this end.

The effects of a post-war economy of abundance cannot but be beneficial to our nation's forests. Whatever increases the productivity of forest

^{1/} Plans are now being worked out for the Station to aid the Bureau of the Census in determining the lumber sawed in our territory during 1941.

lands and forest workers will be in keeping with national policy, and consequently economically sound. Anything that destroys the productivity of the land or decreases the productivity of forest labor will be opposed to national policy and economically unsound. The consequences of such a conclusion are indeed far reaching to forest research workers. They mean that post-war America, and in fact the post-war world, will require the best scientific information available on how to restore, maintain, and enhance the productivity of forest land, the productivity of forest labor, and the utility of forests and forest products.

But obvious as the need for full scale productivity in peace as well as in war may appear, we cannot expect that demobilization of man power and industry following the war will be effected without serious economic dislocation to many people, communities, and regions. Furthermore, we cannot expect that our nation's forests will escape serious overcutting during the war period. It seems reasonable to suppose that a rehabilitation program will be needed not only by the forest but also to absorb temporarily labor discharged from armies and war industries. Such a program may be expected to include forest planting, timber stand improvement, fire control improvement and recreational developments, activities of proven worth during the period 1933 to 1940; but in addition, we may expect an increase in forest development to reduce flood damage, and housing and other community welfare projects that draw upon the forest for raw materials. Logically this work should not be authorized in a haphazard manner, but should be made a part of a well conceived, permanent plan tied into the development program of each individual community. Effective planning must, within the framework of a broad national policy, begin at the community level. It must be the product of community thought, community hope, and community will. The role of technicians is to provide basic facts, to interpret these in terms of community welfare, to suggest various remedial programs and to analyze their probable outcome. The decision as to action must be left largely to the community, though federal agencies and policies should provide aid in removing obstacles to a sound program.

The Station is now engaged in assembling and analyzing the facts upon which a sound program of forest development for the anthracite region can be based. To a lesser extent it is cooperating with other agencies in securing planning data for the Eastern Shore of Maryland and Southern New Jersey. The work needs to be extended to the whole northern forested part of Pennsylvania where many communities, stranded following completion of old growth cutting, are ready for a rebirth as the second growth attains merchantable size.

Maintain a Permanent Research Program

The final and perhaps most important function of the Station during the wartime period is to maintain, without serious interruption, its major long time research projects, particularly those that require uninterrupted

long time observations to solve basic problems in timber management. Our people will always require timber products and the knowledge of how these can most efficiently be grown. Forest research, therefore, is not a temporary activity that can be laid on the shelf when the going gets tough. To be sure, activities and projects should be carefully scrutinized first to make certain that whatever can safely be postponed is deferred, and second, to make certain that permanent projects are not inadvisedly interrupted. For example, the Station has been working for a period of fifteen years on the silvics of northern hardwoods. A vast amount of information has been accumulated that is now being translated into practical forest management technique. If this project should be discontinued today much of the last fifteen years' work would remain sterile knowledge, unavailable in its present form for use in increasing the yield of some six million acres of strategically located and highly productive northern hardwood lands. In southern New Jersey, agriculture is on the retreat, forestry on the advance. To withdraw forest research from this territory during the period when emphasis is being shifted from agriculture to forestry would be to handicap greatly efforts being made toward adjustment, and to postpone indefinitely the time at which this forest land can be placed on a reasonably productive basis.

Just as farmers should not settle on unproductive agricultural land, so also woods workers and forest industries should not depend on forest land inadequate in area, productivity or species distribution to meet their needs. Determining what timber land will produce, and by what means it can be made more productive is, of course, the primary object of forest management research, and as such is basic to long term, land use planning. Because forest research, compared with agricultural research, is still a relatively new activity, and because also it involves far more intricate interrelations among plants and between plants and their environment, interrelations for the most part not subject to direct control by cultural measures, progress towards supplying the basic needs for forest land use planning still lags far behind that for agricultural planning. For this reason, keeping alive the techniques and spirit of forest research during periods of national stress becomes a very real obligation of forest experiment stations. Nothing is more certain than that if the research spirit withers, and if research technique remains static, our country sooner or later must surrender to a more progressive outsider. Too little and too late loses peace as well as war. Research is the key to planning upon which coordinated large scale action can be successfully carried through. We cannot afford to lose this key.

ACCOMPLISHMENTS AND PLANS

Flood Control Surveys

The outstanding contribution of the Station during the past year was the development of a new concept of the role of vegetation in reducing flood runoff. The new concept depends on the capacity of the humus in the upper soil layers to take up water rapidly during periods of excessive rainfall and to give it off slowly. Hitherto, the role of humus was assumed to depend on the amount of water it can hold indefinitely against the force of gravity. It is now known that this is only part of the picture and that the major role of humus is of far greater consequence. Determinations of the moisture content of humus during and immediately following periods of very heavy rainfall show that good humus layers which may be six or more inches in depth can take up as much as 80 to 90 percent of their volume of water of which two-thirds or more is released over a period of 6 to 10 days as the humus returns to its permanent moisture holding capacity. The humus is then ready to take up moisture from another flood producing storm, thereby acting as a self-emptying reservoir. This function is particularly effective on coarse, sandy soils and on heavy loams and clays after they have already reached saturation. The effectiveness of humus is determined by its depth and quality, which in turn depend on the climate, the soil, and the vegetation. Grazing, clear cutting, and burning destroy humus. Once destroyed, the restoration of humus is a slow process that may require from sixty to eighty years before completion. In the Northeast, spruce and long-lived hardwoods are excellent humus builders, pine intermediate, and temporary hardwoods such as aspen and gray birch, poor. The importance of humus in flood control strengthens immeasurably the case for forest planting, good fire protection, and selective cutting of woodland.

Other important findings pertain to the value of conservative agricultural practices in reducing soil erosion. In the first place, soil erosion is found to be selective; that is, the first soil to be lost through erosion is the lighter particles, the humus, clay, and silt. This material is concentrated in the upper soil layers; consequently the removal of the first inch of topsoil reduces soil fertility to a far greater extent than the removal of the next and subsequent inches. In the second place, it was found that soil erosion increased in degree with the length of the clean tilled periods of a rotation system. If only one year of cultivation intervened between hay crops, erosion was slight. Where two years intervened, it was far more than twice as much. These findings, a by-product of the Connecticut Flood Control Survey, introduce entirely new techniques into evaluating the effects of good land use practices on flood runoff.

The Connecticut Survey was completed during the past year and the report, in preliminary form, written. The hydrologic and other sections of this report are now undergoing revision in the Washington Office. The Station also participated in the field work and reports on the Allegheny, Upper Susquehanna and Solomon Creek. Reports on the last two have been reviewed by the Station.

With the completion of the Connecticut Flood Control Survey, on October 15, funds and responsibility for future flood control work at the Allegheny Station were discontinued except insofar as the Station serves as an agent through which men engaged on Preliminary Surveys are detailed, and as custodian of flood control property not yet transferred elsewhere. Elimination of this activity has caused a marked reduction in the budget, personnel, and activity of the Station. During the next fiscal year the Station will plan to review such flood control reports as may be submitted by other agencies. The Station feels that it must remain prepared to resume this work when and if additional flood control surveys are authorized for this territory. Many major flood-contributing streams remain unsurveyed in a territory that has large numbers of damage causing floods.

Forest Economics

Formal economics studies at the Allegheny Station are confined to the Anthracite Survey project. At the beginning of Fiscal Year 1940, when funds for this project became available, serious unemployment was widespread in the anthracite region. The State and local counties were hard pressed to find suitable WPA work projects to absorb these people, and could ill afford sponsor's contributions. The immediate task of the Station was to find some easily financed forest projects that could be quickly undertaken to absorb a portion of the unemployed. This the Station did, and issued a summary of its findings in Anthracite Survey Paper No. 2, entitled, "Intensified protection of Wyoming Valley Forests against fire, through use of community labor." The Station also began a search for possibilities of increasing the public forests in the anthracite territory. A promising opportunity seemed to lie in the establishment of county forests from tax delinquent forest land. A search of county records revealed a total of some 120,000 acres of tax delinquent land, in tracts of over 50 acres in size. More than half of this has been delinquent beyond the period allowed original owners for redemption. Although one of the first studies begun, the search of county records proved time consuming; furthermore tax sales late in 1940, from which we obtained much of our data, delayed the field work. It was not until last year that the results were in shape to release. Anthracite Paper No. 3, entitled, "Tax delinquency of forest lands in the Anthracite Region of Pennsylvania" covers our findings.

Action by State and county authorities on our recommendations for fire improvements and county forests is slow. War industries, some within the anthracite region, more outside of it, have absorbed temporarily large numbers of the unemployed, and in general the war has made it difficult to focus public attention on long-term enterprises. Local defense boards are, however, beginning to realize that intensive protection of forest lands against fire is emphatically a war-time measure. County officials have gone on record as favoring the constructive solution of their problem of tax delinquent lands which is offered by the

creation of county forests. Should peace come soon, or be so long deferred that war planning and post-war planning become indistinguishable, we are confident that our recommendations will receive renewed consideration.

The long term objective of the survey, to determine the extent to which the forests can supplement mining as a permanent source of employment required the gathering of important basic data. Consequently, an inventory of the timber resources was undertaken. Following regular U. S. Forest Survey technique, individual counties were gridded by survey lines at regular spacings, on which plots were located for sampling the timber. During the past year field work in Luzerne, Lackawanna, Wyoming, and Carbon Counties was completed. Office computations have been completed for Luzerne and are well advanced for Lackawanna County. The staff is now engaged in preparing a report on Luzerne County setting forth the forest area, timber volume by sawtimber and cordwood sizes, timber growth and drain, and requirements of the local population and industries for wood and for forests. The report will emphasize the extent to which forests have been depleted and what this depletion means in terms of decreased money income to timberland owners and decreased opportunity for employment of local labor. Preliminary analyses indicate that 64% of the county, or a total of 365,000 acres, is in some kind of forest, but that only 33,000 acres are sawtimber and 82,000 acres merchantable cordwood. Nearly 60,000 acres are in scrub oak or other unmerchantable types. The average sawtimber stand contains 5,600 board feet and grows at the rate of 225 feet per acre per year, gross. The average cordwood stand (combining merchantable and unmerchantable areas) contains 4.3 cords and grows at the rate of .34 cords per acre per year. Although total drain by cutting and natural causes is less than total growth, drain on the sawtimber exceeded growth in 1940. Furthermore defense demands have greatly accelerated at least sawtimber drain in 1941. These facts, together with others that were collected during the survey, form the basis for analyzing the forest situation in Luzerne County and for devising plans whereby a stable forest economy can be developed.

County base maps and others showing forest cover, land ownership, mining use, and simple topography that have been compiled to facilitate the forest inventory have recently proved useful in a number of ways not anticipated at the time of their preparation. Utility companies are using the base maps to plot locations of water conduits, bridges, culverts, power lines, etc., not only for routine service, but also for the information of police and military personnel charged with their protection against sabotage. The County Engineer's office, the Red Cross, and the Luzerne County Defense Council are using these maps to plan air raid protection, relief work, and other defense activities. The Chamber of Commerce used the maps to spot potential industrial sites near Wilkes-Barre to meet a request of the Office of Production Management.

Incidental to the forest inventory has been the determination of conversion factors for changing cubic feet into tons, (about half of all

mine timbers are sold by weight) and the preparation of a complete series of form class volume tables for all species of the anthracite region. Preliminary checks indicate that these tables have wide applicability outside the region, and furthermore, that the number of separate tables required can be reduced to 1/7 by using a specially devised triple logarithmic chart that reads directly in volumes. During the coming year the Station expects to prepare these volume-weight and form-class volume tables for publication. Such information should contribute to better marketing, one of the gravest needs of the region's forest economy. It also expects with Girard's aid to prepare for publication an article on the possibilities of developing universal volume tables based on form class.

Preliminary exploration has indicated that the speed and accuracy of line plot surveys for forest inventory can be greatly increased through utilizing aerial photographs in conjunction with ground work. Sawtimber, cordwood, and reproduction conditions can be delineated on the photographs. It then remains only to sample stand per acre in the sawtimber and cordwood conditions. The Station hopes to refine this technique during the coming year. The importance of a ready means for making timber surveys, forest condition maps, and cover maps for fire protection and military use is so great that the Station can ill afford to discard a method of such promise.

The main job for next year is to present and interpret the results of the forest survey for Luzerne County. Similar interpretations should be prepared for other counties provided the office work is completed. Naturally the collection of basic facts as to timber resources, timber condition, and timber use will be continued to the extent man power and facilities are available.

The forester's central economic problem which war has intensified in the anthracite region as elsewhere, is how to make certain that forest productivity will be built up and maintained. While awaiting the passage of over-all Federal or State legislation to this end, we must not overlook immediate action. In this connection the possibilities of organizing timber producers' associations in the anthracite territory requires early exploration. Associations which have as their objective the obtaining of a fair price to the producer and of maintaining the timberlands in permanently productive condition could do much to stabilize forest employment and forest production in the anthracite territory. It is believed that such associations could obtain preference in contracts with local mines because one of their objects would be the maintenance of a permanent supply of indispensable mine timbers.

The Station has assisted in the collection of information on markets for farm woodlot products in various sections of its territory. During the past year, Gloucester County, New Jersey was covered. Information was obtained concerning not only markets but also timber volumes on farm woodlots, and timber products used on the farm. As a part of the

Agricultural Defense Council work in New Jersey, information is being gathered on the amount of timber sold last year from New Jersey farm woodlots. Farmers anticipating sales during the coming year are to be furnished information on proper cutting practices and on public services available to aid them in obtaining a good market price and a good job of timber harvesting. During the coming year it is planned to make timber marketing surveys in Indiana and Clarion Counties, Pennsylvania. It is also planned to get similar data together for Luzerne and Warren Counties, and for any other counties that can be covered.

During the past year, the Station helped to some extent in obtaining an inventory of the timber requirements of wood using industries in the Philadelphia area. Next year it has promised to participate with the Census in collecting data on total lumber production in the Station's territory.

Forest Management.

Protection from fire

The present war has seen a revival of the use of forest and other fires in both defensive and offensive warfare. To these our East Coast is particularly vulnerable. On the Eastern Shore of Maryland and in southern Delaware, fires frequently become started in the large areas of marsh land covered with dry grasses, sedges, and rushes. Because of the boggy nature of the ground it is almost impossible to attack these fires until they emerge on the high ground when, oftentimes, they have a mile-wide front. The uplands also are highly inflammable. Old fields become covered with dense stands of Andropogon glomeratus and Andropogon virginicus. These grasses stand waist high, and from late August or September until May are dry enough to carry fire at a terrific rate. The heat generated by these grass fires is sufficient to start crown fires in young pine. Beneath the older pine, resinous myrtle and bayberry flare up like torches, carrying the fire into the crown of trees 60 or more feet in height. Equally hazardous is southern New Jersey, which also has large areas of marsh land and a heavy growth of resinous shrubs, including large amounts of mountain laurel. Natural firebreaks are rare and the forest is little broken by cultivated fields that help so much in Maryland to prevent extreme forest destruction. One fire alone burned 80,000 acres last year. The anthracite territory, with its large areas of scrub oak and mountain laurel, is also cursed with frequent and large fires. These prevent the return of valuable timber, threaten buildings and resorts, and frequently fill mine ventilating shafts with smoke.

In warfare, forest and grass fires are used to screen troop movements and landings, to destroy vegetation that might screen the enemy, to furnish signals and smoke screens for raiding parties coming by land, sea, or air, and behind fighting lines to disrupt troop movements and training, and air, land, and water transportation. Forest fires also destroy farms and villages, livestock and poultry, and of course, game.

Our Nation has a great deal at stake in its northeastern forests. Although these at present produce only 8% of the country's total lumber output, they can be relied upon in emergencies to produce far more. The region consumes practically 24% of all lumber and must look more and more to local supplies as transportation becomes crowded. The Northeast has roughly 22% of the Nation's forest land and 36% of the Nation's population. The forests are widely used for recreation of all sorts. Hunting and fishing license revenue is equal to 36% of the Nation's total. The importance of forest land is attested in part by the fact that 41% of all State expenditures for forest protection and forest management is spent in the Northeast.

Considering the values at stake and the difficulties involved in protecting them, the Station's forest fire research program has been modest. Up until last year, this work was financed in part by the State of New Jersey. With the withdrawal of their support, even the small program we had has been drastically curtailed. Last year's accomplishments consisted mainly of completing work begun with funds made available by New Jersey. The detailed analysis of the applicability of the Appalachian danger rating system in New Jersey was completed and made available to forest protection specialists in the territory. This paper showed that the system definitely can be applied advantageously in New Jersey, and a companion paper to acquaint local wardens and inspectors with the technique of fire danger rating is under preparation. Fire danger ratings were made on the Eastern Shore throughout the 1941 fire seasons. A fuel type manual for New Jersey was revised and will be processed for distribution as soon as reproductions of the photographs are available. A study of past forest fires in New Jersey has been completed but has not yet been written up for publication. This is a task for next year. Informal studies of fire damage and rate of timber deterioration were made on the Eastern Shore of Maryland following the serious fire of April 20.

Plans for next year include winding up all current phases of forest fire research, with the exception of the controlled burning experiments that the Station has under way in New Jersey. These will be maintained in accordance with the schedule set up in the working plan. Little more can be accomplished without additional finances. The Station appreciates the very great importance of initiating fire prevention studies for which New Jersey offers an ideal location. Some 1500 to 2000 fires, largely man-caused, occur each year. New Jersey also has a well organized and alert fire control organization anxious to do what it can to improve its effectiveness. The study should, of course, be designed to determine principles applicable throughout the country, particularly to the territory east of the Great Plains that contains 63% of all forest land, has 94% of all forest fires which result in 97% of acreage losses, and 91% of damages. A concerted attack on the problem of forest fire prevention is urgently needed.

Timber for war

Of equal importance to protecting our country from widespread civil and military damage from forest fires is supplying timber needs during the war period. Strategically located supplies become of utmost importance. The loblolly pine forests of Delaware and Maryland have contributed very heavily to both direct and indirect defense needs. Piling, by far the most valuable pine product in the region, is being used by the thousands in the ship yards along the Delaware River and at New York. It is estimated that 500 to 1000 sticks of piling and 100 truck loads of lumber are shipped daily from the Del-Mar-Va peninsula. These forests contribute indirectly to the wood supply of our nation and Britain through the half million board feet of lumber which have gone into new chicken houses in Maryland and Delaware during the past year. Elsewhere in the territory similar cutting for war needs is going on at a rapid rate. A nation at war can ill afford to transport immense quantities of timber over distances of 1000 to 3000 miles if local supplies can be utilized. It likewise can ill afford to waste its man power and machinery on inefficient timber harvesting methods, nor can it afford to use the war period as a time to get rid of low grade standing timber except for uses for which low grade products are fully satisfactory. It is poor national policy to cut straight, clean-boled ash, yellow poplar, hard maple, and cherry, into such low grade products as chemical wood, furnace poles, and mine timbers, but it is equally inefficient to clog our sawmills with defective, crooked sawlogs at a time when high grade timber for war needs is in great demand. We cannot expect to introduce elaborate, untried methods of timber harvesting during the war period, but we certainly should not shrink from doing everything possible to curtail wasteful cutting, especially cutting of immature second growth.

To minimize loss in forest productivity due to heavy cutting for war needs, it is necessary to determine, first, what precautions must be taken to insure continued forest productivity, and second, the extent to which these will increase or decrease the cost of timber harvesting. During the past year the Station has been actively engaged in both phases of this problem in the oak-pine, oak, and northern hardwoods types. On the Eastern Shore of Maryland, loblolly pine blocks were marked for cutting on five and ten year cycles, to compare growth and yield with that obtained by a single cutting at 51 years of age or at any period thereafter. It is expected that partial cutting methods will greatly increase the quantity of high grade piling that can be removed from a stand, and therefore the total monetary yield over a rotation period. These proposals have already been taken up with a piling operator, who assures us of the practicability of each recommended cutting method. On the Standing Stone Experimental Forest and the Stone Valley Forest of State College, cutting experiments in Virginia pine are under way. In each of these, cost of logging as well as silvicultural results are a part of the study. In the northern hardwood type, the Station reexamined pulpwood cuttings made on a selective basis the

preceding year. The practicability of these methods has already been demonstrated. A survey of timber lands cut over 25 to 70 years ago for hemlock bark, with and without removal of other sawtimber, revealed that growth following cutting increased markedly with the amount of growing stock left. A preliminary summary of the data is given below.

Type of cutting	Volume left	Interval since cutting	Average Growth per acre per year. Gross
	Board feet	Years	Board feet
Merchantable saw-timber cut clean	500 to 1000	45 to 70	130 to 200
Merchantable saw-timber cut heavily	2500 - 5000	50 to 70	250 to 300
Merchantable saw-timber cut lightly	6000 to 20,000	25 to 45	440 to 480

A high proportion of the trees left were too small to produce good sawlogs, less than 12 inches in diameter. Leaving them reduced the value of the harvest very little, but netted the timber owner a substantial return.

The Station also studied stands which were cut heavily for timber, and clearcut for chemical wood thereafter. Fair stands of second growth have followed such treatment. The third growth, however, is much less promising due to the fact that it contains a high proportion of low value species such as pin cherry, aspen, and mountain maple, and a high proportion of multiple stem sprouts that as they reach sawtimber size are slow in growth and subject to decay. An 80-acre experiment demonstrating the feasibility of various degrees of selective cutting in northern hardwoods from the standpoint of both timber operating costs and future timber growth, was laid out for cutting.

The current shortage of pulp has caused pulpwood buyers to investigate the possibilities of drawing supplies from the Eastern Shore of Maryland. Small scale operations are being considered which if successful may lead overnight to heavy cutting of immature second growth heretofore protected by lack of an important market. Serious losses in sawtimber production can be anticipated unless pulpwood harvesting is confined largely to thinning operations. Inasmuch as loblolly pine grows densely and thins itself naturally, it is believed that immense quantities of pulpwood can be harvested without jeopardizing future sawtimber yields on the Eastern Shore. This belief is strengthened by the results of thinning experiments carried on in 30-40 year old pine. Current growth as high as 800 board feet per acre has followed conservative thinnings.

In New Jersey it was shown that seed tree cuttings cannot always be relied upon to produce immediately satisfactory reproduction of pitch and shortleaf pine, inasmuch as good seed years do not always occur. On 28 plots, reproduction failed entirely. On another block of 28 plots, 80% stocking resulted. The stocking was higher on plots having a large proportion of mineral soil exposed by mechanical scarification, than on untreated plots. An additional seed tree demonstration cutting was made on a 54 acre tract.

Size of planting stock was found to be very important in the establishment of loblolly pine on old fields on the Eastern Shore of Maryland. Tests made with 6, 7 and 8-inch trees show very significant differences between the sizes after two growing seasons. Indications are that planting stock should have a top 8-inches or more in length to withstand the competition of beard grass (andropogon), where such grass is present. Unfortunately these plots were lost in the fire so no definite conclusion on mortality can be drawn; however, examination before the fire showed the smaller trees to be of poor vigor and likely to die soon.

During the past year the Station began to reap many of the anticipated advantages from maintaining an active research program at Beltsville where Forest Service problems could be investigated by research workers having ready access to the advice and suggestions of some of the Department's topnotch physiologists, horticulturists, and other scientists. For instance, last year the Forest Service undertook the vegetative propagation of slash pine. The Station's contact with workers at Beltsville, University of Maryland, and ~~George Washington~~ ^{Howard A.R.D.} University aided materially in planning this project. Specimens for rooting have already been tested in the moist chambers at ~~George Washington~~ ^{Howard} University. Advice on the treating of cotton and burlap has been obtained from the Bureau of ~~Agricultural~~ ^{HOME} Economics. Help on soils studies has been given by various workers in the Bureau of Chemistry and Soils.
DIVISION OF SOIL CHEMISTRY AND PHYSICS, BUREAU OF PLANT INDUSTRY

Much of the physical development was completed including the dam and weir from stream gaging, exhibit shop, and landscaping around the buildings. The forest nursery was partially developed, and seedbeds planted this last fall. Considerable change in boundaries and area took place as a result of expansion of the airport. To compensate for land relinquished, the Station acquired from the Center a large area of land north of the east-west highway so that the changes have on the whole improved rather than impaired our holdings. Plans to develop the experimental forest were deferred this summer in order that our limited funds and man power might be concentrated on fundamental studies.

The survey of the influence of growth substances on forest tree seedlings and transplants was completed last year. This material has already proven of reference value in answering requests by the Army and by our own administrative and research divisions. A good start was made

on developing the permanent research program. The drought machine formerly at Cass Lake, Minnesota, was shipped to Beltsville and operated during the summer. Preliminary tests on Virginia pine, Scotch pine, loblolly pine, and shortleaf pine showed drought resistance to decrease in the order listed. No control over source of seed or treatment prior to testing existed. Plans are under way to carry out a series of drought tests on seedlings from known seed sources grown under controlled nutritional regimes. During the course of seed collecting wide differences in the soundness of seed from different trees was noticed. Techniques for separating good from bad seed, and also good from poor cones are being investigated. A large series of direct seeding tests are being initiated in cooperation with the Fish and Wildlife Service.

During the coming year, we expect to complete the cutting experiments that were laid out last summer in loblolly pine, Virginia pine, and northern hardwoods. Detailed records on each plot will be taken. New cutting plots in loblolly pine are badly needed and will be installed if suitable areas can be found. There is need for testing the practicability of pulpwood cutting on the Eastern Shore to which operators are beginning to look for supplies. Active timber cruising for developing a management plan for the Standing Stone Experimental Forest has been under way since last summer, and it is expected that the coming summer will see this work completed and the plan in shape. An additional sawtimber harvesting experiment in northern hardwoods should be established during the coming year, if possible. Even more urgent, however, is the need to demonstrate the feasibility of light partial cuttings for chemical wood, and particularly to determine the cost of harvesting trees of various sizes. The Station hopes that it will be possible to get such an experiment under way in the very near future, so that information will be available as to whether or not considerable waste in labor results from the present clearcutting practices. The practicability of cuttings that remove 50% to 60% of the standing timber has already been demonstrated. Aside from the actual experiments, the Station needs to get in the hands of timber operators and farmers the best information it now has on growth and yield following cutting, and how operating costs vary with the size of timber harvested. This we hope will go a long way towards persuading some operators to adopt conservative cutting methods.

At the Beltsville Forest laboratory, effort is to be concentrated chiefly on studies of tree seedling nutrition and how this influences drought and cold resistance. To the extent time is available, an exploratory study will be undertaken to determine the value of forests in restoring the productivity of abandoned field soils. It is believed that the Beltsville location is an excellent place in which to study the rate at which forest vegetation rebuilds the soil of gullied and abandoned fields. The Beltsville Research Forest will continue to serve as a center for referring inquiries on physiological, chemical and other problems in which the advice of the various scientific services of the Department is needed.

Forest Pathology

An important accomplishment by the Division of Forest Pathology of the Bureau of Plant Industry, in which the Station collaborated, was the completion of a study and report entitled, "Stand improvement of northern hardwoods in relation to diseases in the Northeast." This report describes the important tree diseases of northern hardwoods, gives methods of identifying them, and tells how damage caused by these diseases can be minimized through stand improvement measures. Such tree diseases are estimated to cause considerably more damage than fire in the northern hardwood type. No formal studies are contemplated next year. The Station needs badly additional information on the rate at which decay progresses in the valuable sugar maple, black cherry, ash and other northern hardwood trees. It is hoped that this work can be undertaken in a substantial way in the relatively near future.

January 31, 1942

HARVEST CUTTINGS

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Harvest cuttings, beech-birch-maple-hemlock

PURPOSE:

To determine commercially feasible methods of harvesting timber that will prolong the cutting period, gradually increase the quality of timber, perpetuate desirable species, and return high total yields.

REVIEW OF PAST WORK:

Partial cuttings in 60-year-old second growth with holdovers in a combined sawtimber and chemical wood operation left the stand in excellent condition for future sawtimber production. Cutting to a 10-inch diameter limit induced high mortality among the reserved trees. Mature stands containing advanced growth of desirable species can be clearcut with assurance that a good stand will follow, but clearcutting over large areas in immature second growth involves high risk that the third growth will be dominated by pin cherry and multiple stemmed, decay susceptible stump sprouts. Pulpwood per unit volume of solid wood produced from trees 5 to 8 inches in diameter requires 90 percent more labor than that produced from trees 11 inches and larger; in stands 60 years of age, the latter cutting leaves growing stock adequate to produce another harvest cutting within 10 to 15 years.

ACCOMPLISHMENTS DURING PAST YEAR:

Mature stands cut heavily for hemlock bark or sawtimber 45 to 75 years ago, that had advanced growth present of pole size and were kept free of fire, have produced excellent second crops of sawtimber. Stands partially cut for sawtimber 25 to 45 years ago have averaged in annual growth over the period as high as 440 to 480 board feet per acre. A 14-acre demonstration marking plot was laid out to illustrate some of the principles established by these studies. Harvest cutting experiments on a 10 and 20 year cycle were started in an 80-acre stand of decadent old growth on the Kane Experimental Forest to determine the extent to which such stands can be relied upon to furnish high quality sawtimber until the second growth stands attain sufficient size to produce high grade logs. A 66-acre experiment in a 120-year-old stand was laid out and marked for cutting leaving 2, 4, 5, and 8 M.B.F. per acre.

PLANS FOR NEXT YEAR:

Experiments in harvesting second growth stands approaching maturity will be completed and extended. Data on yields following past partial cutting will be prepared for publication. Costs of logging as influenced by quality and volume removed in partial cuttings will be determined. Costs of converting trees of various sizes into chemical wood will be studied.

DATE OF COMPLETION:

Indefinite.

ASSIGNMENT:

Shirley, Hough, Ostrom.

RS-AL
SILVICULTURE
Harvest Cuttings

PROJECT STATUS SHEET

January 31, 1942

HARVEST CUTTINGS

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Harvest cuttings, oak-pine (New Jersey and Maryland)

PURPOSE:

To develop practical methods of harvesting oak-pine stands that will result in high yields of the most valuable products, and ensure adequate seedling reproduction with a high percentage of pine.

REVIEW OF PAST WORK:

In 1940, 56 plots were established in two types of oak-pine stands to test the use of seed tree cuttings followed by varying types of brush disposal and soil scarification as methods of getting natural seedling reproduction of pine.

ACCOMPLISHMENTS DURING PAST YEAR:

Apparent seed crop failure caused 28 plots to be ineffective in their first year. Initial measurement of the other 28 plots showed up to 80% stocking by new seedlings, with 87% occurring on mineral soil. Merchantable oak and brush were cut on a 54-acre tract to be reproduced to pine by the seed tree method. A cutting experiment begun in a 51-year-old loblolly pine stand provides for comparing economic returns and yield from harvesting on 5 and 10 year cutting cycles with clearcutting at any age. It is anticipated that yield of piling, the highest value product, will be increased by short cutting cycles. Problem analyses were prepared for the oak-pine type in Maryland, Delaware, and in New Jersey.

PLANS FOR NEXT YEAR:

Complete establishment of seed tree experiment. Artificially seed 28 plots that failed to reproduce through lack of seed supply. Complete cutting experiment in 51-year-old loblolly pine. Establish pulpwood harvesting experiments on 3, 5, 10, and 15 year cutting cycles in loblolly pine, with a view towards increasing the amount and quality of piling and sawtimber. Extend piling and sawtimber cutting experiments if suitable stands can be located.

DATE OF COMPLETION:

Indefinite.

ASSIGNMENT:

Schnur, Little, Fahnestock.

RS-AL
SILVICULTURE
Stand Improvement

PROJECT STATUS SHEET

January 31, 1942

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Harvest cuttings, Oak

PURPOSE:

To determine the effect of various harvest cutting methods on the yield and reproduction of forests in the oak type of Pennsylvania, New Jersey, and Maryland.

REVIEW OF PAST WORK:

This is a new project for the Allegheny Station. Permanent growth plots in uncut timber have been maintained for many years by the Pennsylvania Bureau of Forestry. Exploratory studies have been undertaken in woodlots of Pennsylvania State College.

ACCOMPLISHMENTS DURING PAST YEAR:

Cruising of timber on the Standing Stone Experimental Forest was started last year, and division of the tract into management compartments begun. A partial cutting experiment in Virginia pine was established on the College tract and a plan drawn up for a companion study on the Station tract.

PLANS FOR NEXT YEAR: The plots in Virginia pine will be cut over.

Data for a management plan for the tract will be gathered as opportunity affords. Experimental planting for gully control will be made near the headquarters. Thinning in oak for pulpwood will be initiated if suitable stands can be found.

DATE OF COMPLETION:

Indefinite

ASSIGNMENT:

Stevenson, Bartoo

RS-AL
SILVICULTURE
Stand Improvement

PROJECT STATUS SHEET

January 31, 1942

STAND IMPROVEMENT

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Stand improvement, beech-birch-maple-hemlock

PURPOSE:

To determine the extent to which large areas of second growth northern hardwood forest can be improved in composition, growth rate, and quality by practical stand treatments.

REVIEW OF PAST WORK:

Commercial thinnings for chemical wood can be made in well stocked stands of 30 to 40 years of age, removing between 5 and 10 cords per acre. If the trees left are skillfully selected and properly spaced a rapidly growing stand that will produce high quality sawtimber results. Heavy thinning at this age introduces the hazards of understocking, high inflammability, glaze injury, wind breakage, sun scald, and epicormic branching; it also increases the proportion of sprouts to seedlings. Understocking and a high proportion of multiple stemmed sprouts are the most common and serious obstacles to high quality sawtimber production from second and third growth forests. Decay hazard from multiple stem sprouts can be largely eliminated by thinning or weedings if done before stands reach 20 years of age. The extent to which such work will repay its cost is yet to be determined.

ACCOMPLISHMENTS DURING PAST YEAR:

In cooperation with the Division of Forest Pathology, Bureau of Plant Industry, a study of the possibilities through stand improvement measures of reducing decay hazard in second growth forests was completed. Stump sprouts of black cherry, beech, and sugar maple can be eliminated more cheaply and effectively by simply breaking or cutting the sprouts from stumps for two or more consecutive years, than by girdling or poisoning the stump. Large scale commercial thinnings were begun on the Allegheny National Forest to test further the techniques developed on small scale studies. Other tests are under way on property of the Armstrong Forest Company.

PLANS FOR NEXT YEAR:

Survey the results of recent commercial partial cuttings of second growth on the Allegheny National Forest and Armstrong Forest Company lands. Establish a series of light improvement thinnings on the Kane Forest. Prepare existing data on thinnings and weedings for publication.

DATE OF COMPLETION:

Indefinite.

ASSIGNMENT:

Shirley, Hough, Ostrom.

RS-AL
SILVICULTURE
Stand Improvement

PROJECT STATUS SHEET

January 31, 1942

STAND IMPROVEMENT

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Stand improvement, oak-pine type of Coastal Plain

PURPOSE:

To develop practical methods by which the composition, growth, and quality of immature stands can be improved.

REVIEW OF PAST WORK:

Oak coppice with a pine understory cannot be converted to pine by a single thinning in the oak. Seed dispersal habits of white-cedar and successional trends on lowland sites in New Jersey have been determined. Dense, stagnant old field stands of Virginia pine respond well if thinned at approximately 10, 16, and 25 years of age, reducing the stand at the last thinning to 700 trees per acre. White pine plantations spaced 6x6 feet do best if thinned at 15 to 20 years of age. Pruning should be done before age 25 years. Effective pruning can be done with a hand saw by climbing the tree and working down. Loblolly pine responded well to thinnings at 23 and 30 years of age that removed trees calculated to die within 10 and 15 years.

ACCOMPLISHMENTS DURING PAST YEAR:

In swamps and low lying St. Johns soils of New Jersey, 36 plots have been established to study regeneration of white-cedar and how its establishment and growth is influenced by such factors as distance and direction of seed dispersal from isolated trees, various stand improvement practices, age and density of stand, and browsing by deer.

PLANS FOR NEXT YEAR:

Plot remeasurements will be carried on according to schedule and additional seed dispersal studies will be begun. If possible, a study of white-cedar planting stock will be undertaken to determine the best grade for field planting.

DATE OF COMPLETION:

Indefinite.

ASSIGNMENT:

Little, Fahnestock, Schnur.

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ROCKY MOUNTAIN FOREST & RANGE
STATION

January 31, 1942

SILVICS

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Silvics, beech-birch-maple-hemlock

PURPOSE:

To determine the silvical characteristics of species and the ecology of stands, as the bases for silvicultural practices.

REVIEW OF PAST WORK:

Drought, glaze, frost, fire, and wind, within the general climatic region of the Allegheny Plateau, cause widespread losses in mature stands and young growth. Topography, aspect on steep slopes, and soil drainage, are major factors influencing species composition and growth in second growth stands. Great diurnal and seasonal temperature extremes occur in "frost pockets", areas on low ground cleared by fires or cutting that are slow to reproduce even when fenced to exclude deer and rabbits. Similar low areas covered with high forest do not show "frost pocket" conditions. Life histories of stands show that the desirable white pine, hemlock, black cherry, white ash, yellow poplar, and basswood, as well as the less desirable birches and red maple, become established following such catastrophes as windthrow, drought, or fire. Heavy cuttings in the original forest increase the abundance of black cherry, red maple, and sweet birch; light cuttings favor tolerant sugar maple, beech, hemlock, and yellow birch. Ability to persist under suppression and rapid sustained growth when released are outstanding silvical characteristics of the tolerant species.

ACCOMPLISHMENTS DURING PAST YEAR:

Topography, aspect, light, soil moisture, duff temperature, and seedbed conditions affect the germination and first year survival of hemlock. Steep north and west slopes are most favorable. Soil drying during the growing season may be fatal. At low light intensities root growth is poor and may result in death from drought during certain seasons. Better first year survival and growth occurred in 31% than in 4, 11, 67, or 100% light intensity. Rabbits may be a major factor in reducing the abundance of tree reproduction. Fencing to exclude deer increased tree reproduction 4 - 13%, while protection from both deer and rabbits resulted in 230 - 300% increase in the reproduction on plateau and lower slope sites.

PLANS FOR NEXT YEAR:

Study of the factors influencing the success of hemlock regeneration will be continued. Observations on the reproduction of other species after various degrees of thinning and harvest cutting will be made. Quadrats to study natural reproduction and lesser vegetation will be established in the Tionesta Natural Area.

DATE OF COMPLETION:

Indefinite.

ASSIGNMENT:

Shirley, Hough, Ostrom.

RS-AL
SILVICULTURE
Silvics

PROJECT STATUS SHEET

January 31, 1942

SILVICS

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Silvics, oak-pine

PURPOSE:

To determine, as the basis for silvicultural practices, the ecology of stands and the silvical characters of the principal species, including the effect of environmental factors on natural regeneration by seed or sprout.

REVIEW OF PAST WORK:

Seed production of oak; seed dispersal of pine and Atlantic white-cedar; the effect of site, animals, insects, and seedbed on reproduction in the oak-pine type; relation between leaf area and root system of sprouts and those of parent tree; vigor of sprouting by species of oak, have been studied and reported in 17 technical notes and papers in various journals. As a basis for white-cedar management, a study of the lowland sites in southern New Jersey was initiated in 1940 to determine the successional stages and climax and the factors controlling succession. Mature white-cedar stands disperse some 8-1/2 million seeds per acre per year; shortleaf and pitch pine, 3,000 to 300,000.

ACCOMPLISHMENTS DURING PAST YEAR:

A report on phenological observations was completed and published. A progress report on the lowland succession study was completed. Further data on minor vegetation was obtained, and laboratory work was begun to determine conditions required for successful germination and establishment of white-cedar.

PLANS FOR NEXT YEAR:

Continue study of factors influencing establishment, growth, and reproduction of cedar.

DATE OF COMPLETION:

1943.

ASSIGNMENT:

Little.

RS-AL
SILVICULTURE
Silvics
Fundamental Studies

PROJECT STATUS SHEET

January 31, 1942

FOREST MANAGEMENT, FUNDAMENTAL STUDIES

FIELD DIVISION: Forest Management

WORK PROJECT: Silviculture

LINE PROJECT: Silvics, Fundamental Studies, Beltsville

PURPOSE:

To measure, analyze, and evaluate various ecologic, genetic, and physiologic factors in relation to initial establishment, survival, and subsequent development of several commercial timber species, and, whenever possible, to deduce basic principles of general applicability to forest management.

REVIEW OF PAST WORK:

Laboratory, main physical plant, and grounds developed, equipped, and improved for occupancy and use. General forest improvement program outlined ready for action as soon as CCC or other labor becomes available. Survey of fundamental problems made.

ACCOMPLISHMENTS DURING PAST YEAR:

Preliminary problem analyses made of seedling nutrition, drought hardiness, and soil improvement. Review of growth substance literature on forest regeneration completed and report prepared. Working plans for nutrition and drought studies prepared. Experimental nursery area cleared, plowed, and 36 seedlots planted to provide material for laboratory analysis. Drought resistance of Scotch, Virginia, loblolly, and shortleaf pine tested, showing that Virginia pine (Pennsylvania source) was most resistant, and shortleaf pine (Alabama source) was least resistant. Cooperative study of seeding, planting, and wildlife relationships initiated with Fish and Wildlife Service. 1200 acres of new forest area acquired through transfer from Farm Security Administration, bringing Beltsville Experimental Forest total to about 3,000 acres. Preliminary work on survey of experimental forest undertaken.

PLANS FOR NEXT YEAR:

Carry out initial phases of nutrition and drought experiments. Carry out seeding, planting, wildlife study as per schedule. Undertake soil improvement study with Bureau of Plant Industry, Division of Soil Physics and Chemistry. Continue experimental forest survey and inventory, and forest improvement program, if CCC and other help becomes available.

DATE OF COMPLETION:

Indefinite.

ASSIGNMENT:

Ikki, Gregory.

RS-AL
MENSURATION
Stand Studies

PROJECT STATUS SHEET

January 31, 1942

STAND DEVELOPMENT, GROWTH AND YIELD

FIELD DIVISION: Forest Management Research

WORK PROJECT: Mensuration

LINE PROJECT: Stand Studies

PURPOSE:

To determine the growth and yield of stands, and to analyze the factors governing growth and development as a basis for sound forest management.

REVIEW OF PAST WORK:

Growth and development studies of loblolly pine were begun by the Forest Service in Maryland in 1906 and maintained in cooperation with the Maryland State Department of Forestry. Results of past studies were published in one Maryland State Bulletin and two Jour. of Agri. Research articles. Average growth on 22,155 acres of merchantable and pine pole stands in Worcester County, Maryland, was found to be 360 board feet per acre per year. Mean annual diameter growth of 0.16-0.18 and 0.10-0.15 inches for pines and hardwoods respectively were found. Average mortality in 5 years for loblolly pine was found to be 42% for 2-inch trees, 9% for 8-inch, 1% for 12-inch, and 0% for all trees above 16 inches. Volume tables for loblolly pine are available in Technical Note #25. Volume and yield tables for oak were published in USDA Technical Bulletin 560.

ACCOMPLISHMENTS DURING PAST YEAR:

Current remeasurement of permanent sample plots.

PLANS FOR NEXT YEAR:

Analyze permanent sample plot records and prepare paper on yield of old field stands of loblolly pine.

DATE OF COMPLETION:

Indefinite. (Permanent plots should be remeasured for 10-20 years more if no cutting or other disturbances occur).

ASSIGNMENT:

Schnur.

RS-AL
REGENERATION
Planting

PROJECT STATUS SHEET

January 31, 1942

FOREST PLANTING

FIELD DIVISION: Forest Management Research

WORK PROJECT: Regeneration

LINE PROJECT: Planting

PURPOSE:

To develop feasible planting methods that will ensure high survival, rapid growth, and excellent quality of forest plantations.

REVIEW OF PAST WORK:

Preliminary results on interplanting conifers in southern New Jersey oak coppice have been published. Red pine seedlings from 50 seed sources and 9 climatic regions were planted in 1937 at Kane, Pa. A study of three 10-year-old administrative plantations on Allegheny National Forest and adjacent areas in 1936-37 indicate species best adapted to various sites and conditions. Study of size of stock, methods of planting, and species adaptation on difficult sites started in test plantations in 1938. Improved methods of shipping, heeling-in, and handling planting stock in the field were suggested in Occasional Paper No. 2. A study of development of 20-year and older plantations in northwestern Pennsylvania indicates red pine to be superior in form, height growth and diameter growth to all other species. The larches, jack pine, and Norway spruce followed in the order listed. Hardwoods were generally not successful and row mixtures inferior to block mixtures.

ACCOMPLISHMENTS DURING PAST YEAR:

The information obtained from the survey of older plantations in northwestern Pennsylvania was published in Occasional Paper No. 3. Test plantings of bald cypress were set out on the Eastern Shore Experimental Forest, two of which were destroyed by fire.

PLANS FOR NEXT YEAR:

Prepare data on test plantations in northwestern Pennsylvania for publication. Complete report on New Jersey interplantings. Clean and extend cypress plantings.

DATE OF COMPLETION:

1945; red pine source of seed study 1977.

ASSIGNMENT:

Schnur, Hough, Ostrom, Little.

RS-AL
FIRE
Control

PROJECT STATUS SHEET

January 31, 1942

CONTROL OF FIRE

FIELD DIVISION: Forest Management Research

WORK PROJECT: Forest fire protection

LINE PROJECT: Control

PURPOSE:

To obtain information essential to the sound planning of forest fire control, including elapsed time, cost, transportation, firebreak, and water supply studies.

REVIEW OF PAST WORK:

Work was started in 1936 in cooperation with New Jersey Forest Fire Service and Region 7, U. S. Forest Service. Transportation and water supply studies on 186 fires showed tank trucks could have been used advantageously on 86%. Methods of mapping and classifying roads and water supplies for fire protection were determined. Encouraged by these studies, New Jersey has developed an effective fleet of tank trucks. A punch card analysis of the New Jersey 1931-38 fire record was made, and the first draft of a paper was completed based on those data. A study of the relative costs and effectiveness of disked and burned firebreaks was begun.

ACCOMPLISHMENTS DURING PAST YEAR:

A paper on "The Applicability of the Appalachian Danger Rating System in New Jersey" was put out in mimeographed form. The disked vs. burned firebreak was continued but badly hampered by machinery breakdowns. A "Fuel Type Manual for New Jersey" was prepared for publication.

PLANS FOR NEXT YEAR:

Finish diskings of firebreaks (if possible), and complete report.

DATE OF COMPLETION:

Spring, 1942.

ASSIGNMENT:

Fahnestock.

RS-AL
FIRE
Effects

PROJECT STATUS SHEET

January 31, 1942

EFFECTS OF FIRE

FIELD DIVISION: Forest Management Research

WORK PROJECT: Forest fire protection

LINE PROJECT: Effects

PURPOSE:

To determine the effects of fire on the tree, the forest, and the site, including effects of controlled fires on seedbed conditions and species composition, as a basis for formulating sound silvicultural and fire protection policies and plans.

REVIEW OF PAST WORK:

Comparative fire resistance determined for six important tree species, in 1930. In cooperation with the State of New Jersey, a revised method of fire damage appraisal was worked out; an 80-acre controlled burning experiment was begun in 1936-37, and a 14-acre one in 1940. Fire damage to standing trees from controlled burning was found to be reduced by use of the safety-strip method of pretreatment.

ACCOMPLISHMENTS DURING PAST YEAR:

Routine plot remeasurement and maintenance in New Jersey. After the serious fire of April 20 on the Eastern Shore Experimental Forest, Maryland, a study of deterioration of fire killed loblolly and pond pine was begun. Samplings have been made at 15 and 30 day intervals.

PLANS FOR NEXT YEAR:

Analyze data from the 80-acre experiment in New Jersey, write a progress report on it, and decide on future procedure. In Maryland, continue sampling of deterioration of loblolly and pond pine through April 1942. Analyze results and write note for publication.

DATE OF COMPLETION:

1942 in Maryland; 1952 for both studies in New Jersey.

ASSIGNMENT:

Little, Fahnestock, Schnur.

RE-AL
SOCIAL BENEFITS
Anthracite Region

PROJECT STATUS SHEET

January 31, 1942

FOREST EMPLOYMENT POSSIBILITIES, ANTHRACITE REGION

FIELD DIVISION: Forest Economics Research

WORK PROJECT: Private Forestry

LINE PROJECT: Social aspects

PURPOSE:

To determine the extent and character of present and potential future employment in forests and forest industries of the Anthracite Region.

REVIEW OF PAST WORK:

Problem analysis prepared and working plans written for initial phases. In cooperation with R-7 possibilities explored of improving fire protection through construction of improvements and otherwise. A series of jobs suitable for emergency labor have been uncovered. A forest inventory of the region planned and initiated. Preparation of base and other maps was begun utilizing topographic maps and aerial photographs.

ACCOMPLISHMENTS DURING PAST YEAR:

Study of tax delinquency of forest land completed and mimeographed, covering the area of land delinquent, rates of assessments and taxation, and proportion forest taxes are of total taxes. Completed inventory in Luzerne, Lackawanna, Wyoming and part of Carbon Counties. Completed growth, drain, and requirements in Luzerne County. Completed land use map for Lackawanna County, and forest condition maps for Luzerne, Wyoming and Carbon Counties. Worked up volume tables and weight-volume conversion tables.

PLANS FOR NEXT YEAR:

Complete Luzerne County Report. Continue inventory of region to extent WPA help is available. Publish regional and form class volume tables, and table of mine prop weights. Prepare paper on applicability of universal form class volume tables. Continue collection and analysis of growth, drain and requirement data for other counties. Explore opportunities for a forest producers' association. Cooperate with local defense efforts in improving fire protection and in locating industrial sites and wood supplies as raw material. Cooperate with agencies working towards improved mine water control.

DATE OF COMPLETION

Final regional reports July 1, 1943.

ASSIGNMENT:

Forbes, Mesavage, Todd

RIFC-AL
FLOOD CONTROL

Preliminary Examinations

PROJECT STATUS SHEET

January 31, 1942

PRELIMINARY EXAMINATIONS, FLOOD CONTROL

FIELD DIVISION: Flood Control Surveys

WORK PROJECT: Flood Control Surveys

LINE PROJECT: Preliminary examinations, flood control

PURPOSE:

In cooperation with the Soil Conservation Service and Bureau of Agricultural Economics, to determine from preliminary examinations of watersheds in New England and Middle Atlantic States, as listed in the Flood Control Act of 1936 and its amendments, whether there is justification for a flood control survey.

REVIEW OF PAST WORK:

Preliminary examination reports with positive recommendations have been submitted on the Upper Susquehanna River (New York and Pennsylvania), Connecticut River (New Hampshire, Vermont, Massachusetts and Connecticut), Lehigh, Youghiogheny (Pennsylvania, Maryland, and West Virginia), Kiskiminitas, Conemaugh, Allegheny Rivers (Pennsylvania), and Patuxent River (Maryland). Negative recommendations are found in report on the Blackstone River (Rhode Island and Massachusetts), Passaic River (New Jersey), and Codorus Creek (Pennsylvania).

ACCOMPLISHMENTS DURING PAST YEAR:

Completion of field work on Allegheny River and Solomon Creek under B. A. E. direction.

PLANS FOR NEXT YEAR:

None. Responsibility for this work has been shifted to the B. A. E.

DATE OF COMPLETION:

Indefinite.

ASSIGNMENT:

Mollenhauer and Pierce detailed to B. A. E.

RIFC-AL
FLOOD CONTROL
Watershed Surveys

PROJECT STATUS SHEET

January 31, 1942

WATERSHED SURVEYS, FLOOD CONTROL

FIELD DIVISION: Flood Control Surveys

WORK PROJECT: Flood Control Surveys

LINE PROJECT: Watershed surveys, flood control

PURPOSE:

To determine by detailed surveys of designated watersheds if revised land use and upstream engineering measures will aid significantly in control of floods and erosion.

REVIEW OF PAST WORK:

Survey reports on Buffalo, Codorus and Turtle Creeks have been submitted to Washington.

ACCOMPLISHMENTS DURING PAST YEAR:

Reports on the Morrimack and Youghiogheny Rivers were given office reviews, edited, and transmitted to the Washington Office with statements to the effect that the reports were inconclusive due to incomplete field data upon which definite recommendations could be based. The Upper Connecticut report recommending a positive program of flood control, well substantiated by basic data, was completed, reviewed, edited, and submitted to the Washington Office for checking. The Upper Susquehanna River Survey report prepared by the S. C. S. was reviewed and recommendations for revisions made to the Regional Conservator.

PLANS FOR NEXT YEAR:

None. Financial support for work at the Allegheny Station has been withdrawn.

DATE OF COMPLETION:

Indefinite.

ASSIGNMENT:

No personnel assigned to this work.

ALLEGHENY FOREST EXPERIMENT STATION

PERSONNEL - 1941

Overhead Administration

Hardy L. Shirley, Director

Hazel L. Stiles, Principal Clerk
Margaret R. Evans, Clerk.
Laura Lewis, Assistant Clerk. (SST 10/16/41)
Katherine F. McKeaney, Sr. Stenographer

Field Divisions

Beltsville Experimental Forest and Laboratory, Laurel, Maryland

T. Ewald Maki, Silviculturist

Eastern Shore Experimental Forest, Parsonsburg, Maryland

G. Luther Schnur, Silviculturist

Kane Experimental Forest, Kane, Pennsylvania

Ashbel F. Hough, Assistant Silviculturist

Lebanon Experimental Forest, New Lisbon, New Jersey

Silas Little, Jr., Assistant Silviculturist

Standing Stone Experimental Forest, Manor Hill, Pennsylvania

Ronald A. Bartoo, Agent

Work Projects

Forest Management

(Hardy L. Shirley, In Charge)

Lillian E. Taylor, Sr. Clerk (Statistical)
Mildred Shugert, Under Clerk Typist (SST 3/24/41)

Beech-Birch-Maple-Hemlock

Ashbel F. Hough, Assistant Silviculturist
Carl E. Ostrom, Junior Forest Ecologist (LWOP 1/1-6/8;
9/23-12/31)
Frederick H. McClennen, Jr., Under Assistant to Technician
(5 mos.)
Edward C. Shearer, Under Agric. Aid (3 mos.)

Forest Management (Cont'd.)

Oak-Pine

G. Luther Schnur, Silviculturist
Silas Little, Jr., Asst. Silv. (LWOP 11/21/41)
George R. Fahnestock, Jr. Forester
Roland H. Ferguson, Agric. Aid (4-1/2 mos.)
Ralph P. Broomall, Asst. to Tech. (SST 9/10/41)
Edgar E. Marvel, Under Agric. Aid (4 mos.)

Oak

Donald D. Stevenson, Collaborator
Ronald A. Bartoo, Agent
Frederick H. McClennen, Under Asst. to Tech. (4 mos.)
Richard J. Blake, Under Agric. Aid (3 mos.)

Beltsville Experimental Forest and Laboratory

T. Ewald Maki, Silviculturist
Arthur S. Todd, Jr., Jr. Forester (5-1/2 mos.)
G. Robinson Gregory, Agricultural Aid (EOD 5/1/41)
Hubert Marshall, Student Assistant (3 mos.)
Eugene Holdaway, Laborer (3-1/2 mos.)

Forest Economics

Reginald D. Forbes, Senior Forester, In Charge
Clement Mesavage, Assistant Forester
Clifford W. Beck, Agent (SST 9/23/41)
Arthur S. Todd, Jr., Jr. Forester (3 months)
Edward W. Carter, Special Advisor
David R. Palmer, Jr. Engr. Draftsman (2 mos.)
Florence Aronson, Jr. Stenographer
Michael Olexis, WPA Project Supervisor
Stanley Filip, WPA Project Supervisor

Flood Control Surveys

Wm. Mollenhauer, Jr., Forester, In Charge
Edward Bogdziewicz, Engineering Draftsman (SST 8/11/41)
Eileen M. Langner, Asst. Clerk Stenographer (SST 10/16/41)
Evelyn Manzi, Jr. Stenographer (SST 4/24/41)

Preliminary Surveys

Earl J. Rogers, Assistant Forester (Detailed to Bureau of
Agricultural Economics, 8-1/2 mos.)
Raymond W. Pierce, Assistant Engineer (Hyd.) (Detailed to
Bureau of Agricultural Economics (2-1/2 mos.); on
detail outside territory 8 months.

Flood Control Surveys (Cont'd.)

Allegheny-Kiskiminitas Survey

Frank F. Tuthill, Assoc. For., Sr. Representative (SST 8/1/41)
Emil F. Meyer, Assistant Forester (4-1/2 mos.)
Raymond W. Pierce, Assistant Engr. (Hyd.) (1-1/2 mos.)

Upper Susquehanna

Harold L. Mitchell, Assoc. Silviculturist (SST 7/16/41)
Edward B. Williams, Assistant Forester (SST 11/1/41)
Marshall T. Augustine, Jr. Forester (SST 7/1/41)
Herbert J. Mols, Jr. Forester (SST 8/25/41)
Earl J. McCracken, Assistant Agric. Aid (SST 7/15/41)
Arthur S. Todd, Jr., Jr. Forester (3-1/2 mos.)
Arthur E. Gruhl, Assistant Agricultural Aid (SST 5/1/41)
Charles E. Critchfield, Laborer (SST 7/15/41)

Connecticut

Walter K. Starr, Associate Conservationist
J. Harold Bauer, Associate Engineer (SST 12/16/41)
Harold F. Morey, Assistant Silviculturist
Theodore R. Jones, Assistant Forester (SST 12/16/41)
Basil A. Plusnin, Jr. Forester (SST 7/17/41)
George R. Trimble, Jr., Jr. Forester (SST 5/26/41)
Sidney J. Grossman, Jr. Forester
Halsey M. Hicks, Jr. Forester (SST 7/16/41)
Harry Roger Slayback, Asst. to Tech. (SST 7/1/41)
Eli J. Fenchak, Under Asst. to Tech. (Inducted into Army 7/18/41)
Marlin E. Wolfe, Asst. Agric. Aid (SST 4/27/41)
Richard M. Sawyer, Asst. Engr. Draftsman (SST 10/26/41)
Andrew J. Nelson, Asst. Engr. Draftsman (SST 7/20/41)
David W. Lippert, Assistant Forester (SST 11/1/41)
Clarence N. Morang, Associate Engineer
Emil F. Meyer, Assistant Forester (4 mos.)
Evelyn C. Emerson, Asst. Clerk Stenographer (SST 11/15/41)
Vassa N. Plusnin, Jr. Stenographer, (5 months)

Detailed from Bureau of Agricultural Economics

Morris L. Weinberger
J. C. Deubner
W. S. Thomas

Detailed from Soil Conservation Service

N. J. Curtis
F. J. Gladwin
J. E. Prettyman

PUBLICATIONS -- 1941

Printed

- Forbes, R. D. Federal forest research in Pennsylvania. Bull. of the Associates, Morris Arboretum 3(18). February 1941.
- Forbes, R. D. Forests and jobs in the Anthracite Region of Pennsylvania. Jour. For., Proceedings Number 39(2):197-201. Feb. 1941.
- Forbes, R. D. Review, "The Last Raft", by Joseph Dudley Tonkin. Forest Leaves 31(3):9-10. May-June 1941.
- Grossman, Sidney J. Comments on "Strip planting for flood control" by C. H. Diebold, Jour. For. 38(10):810-12, 1941. Jour. For. 39(8):728-730. 1941.
- Hough, A. F. Natural area established in Northwestern Pennsylvania virgin forest. Ecology 22(1):85-86. January 1941.
- Hough, A. F. A primeval laboratory in Penn's Woods. Scientific Monthly 53(3):290-293. 1941.
- Hough, A. F. Tionesta Area set aside. Nature Magazine 34(3):140. March 1941.
- Hough, A. F. Review, "Coniferous forest plantings in Central Pennsylvania", by Donald D. Stevenson, Bull. 394, Penna. State College. Jour. For. 39(5):495-6. May 1941.
- Little, Silas, Jr. Calendar of seasonal aspects for New Jersey forest trees. Forest Leaves 31(4):1-2, 13-14. July-Aug. 1941.
- Shirley, Hardy L. Review, "Conservation of Renewable Natural Resources." by Raphael Zon, et al. Jour. For. Vol. 39 #12, 1039 - 1040.
- Shirley, Hardy L. Restoring Conifers to Aspen Lands in the Lake States. USDA Tech. Bull. #763. March, 1941.

Multilithed and Mimeographed

- Forbes, R. D. and Clifford W. Beck Tax delinquency of forest lands in the Anthracite of Pennsylvania. Anth. Survey Paper #3. June 1941.
- Hetzel, John E. Forest plantations in Northwestern Pennsylvania. Occ. Paper No. 3. April 15, 1941.
- Hough, A. F. Pulpwood piece cutters profit by selective cutting. Tech. Note No. 31. June 1941.
- Little, Silas, Jr. Appraising forest fire damage in New Jersey. Occ. Paper No. 4. October 1941.
- Ostrom, Carl E. Eliminating hardwood stump sprouts. Tech. Note No. 32. November 1941.

ALLEGHENY FOREST RESEARCH ADVISORY COUNCIL

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Victor Beede	Head, Department of Forestry, Pennsylvania State College, State College, Pa.
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E. O. Ehrhart	Forester, Armstrong Forest Company, Johnsonburg, Pa.
S. W. Fletcher	Director, Pennsylvania Agricultural Exper- iment Station, State College, Pa.
O. E. Jennings	Head, Department of Biology, University of Pittsburgh, Pittsburgh, Pa.
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Louis Krumenacker	Manager, Krumenacker Lumber Company, Stoyestown, Pa.
D. C. Lefevre	Superintendent of Lands, Clearfield Bituminous Coal Company, Indiana, Pa.
William H. Martin	Director, New Jersey Agricultural Exper- iment Station, New Brunswick, N. J.
H. Gleason Mattoon	Secretary, Pennsylvania Forestry Assoc- iation, Philadelphia, Pa.
Stanley Mesavage	Forester, Wyoming Valley Chamber of Commerce, Wilkes-Barre, Pa.
David W. Robinson	Executive Secretary, Interstate Commission on the Delaware River Basin, Philadel- phia, Pa.
M. B. Saul	Counsel, The Morris Foundation, Morris Arboretum, Philadelphia, Pa.
George L. Schuster	Director, Agricultural Experiment Station, Newark, Delaware
J. Spencer Smith	President, New Jersey Board of Commerce and Navigation, Tenafly, New Jersey
W. S. Taber	State Forester, Dover, Delaware
Ezra B. Whitman	Engineer, Whitman, Requardt and Smith, Baltimore, Maryland
C. P. Wilber	State Forester, Department of Conservation and Development, Trenton, N. J.
Abel Wolman	Professor Sanitary Engineering, Johns Hopkins University, Baltimore, Md.
Hardy L. Shirley, <u>Secretary</u>	Director, Allegheny Forest Experiment Station, Philadelphia, Pa.